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ABSTRACT

This study investigated the effects of a faculty development program offered to increase positive interactions between students and faculty and the effects of these interactions on student achievement and retention. The Gaining Retention and Achievement for Students (GRASP) program supports the accreditation process of the Accreditation Board of Engineering and Technology through faculty development. Students enrolled in eight engineering classes completed an interactive learning style instrument to show their preferred learning styles. Observations of selected civil engineering and mechanical engineering classes at New Mexico State University and documentation of student interactions supplemented the learning style information. Data were compiled for 677 students in 8 classes. There was an average increase of 9% in student retention and achievement from the semester before the faculty participated in the program to the current semester. These results were measured through students' final course grades and the number of students failing or withdrawing from the courses. The increases were especially noted for female students. The semester before the interaction project, some courses had a retention/achievement rate for female students as low as 50%. (SLD)

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Gaining Retention and Achievement for Students Program (GRASP)
A Faculty Development Program to Increase Student Success

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Abstract

Increasing student retention and achievement is the focus of the research we have done in the GRASP program. Research indicates increasing interactions during class between faculty and students and among students increases their achievement in the class and retention in their engineering program. This paper presents an empirical investigation of a faculty development program offered to increase positive interactions between students and faculty, and investigates the effect of these interactions on student achievement and retention. This study found student retention and achievement can be improved by up to 16%.

Introduction

The Secretary of Education of the United States Department of Education lists ABET (Accreditation Board of Engineering and Technology) as the nationally recognized agency responsible for accreditation of educational programs leading to degrees in engineering. To attain this recognition, ABET must include as part of the accrediting process an institutional or program self-study and an on-site review by a visiting team. The self-study is expected to be a qualitative assessment of the strengths and limitations of the institution or program, including the achievement of institutional and program objectives, and should involve broad and appropriate constituent groups in its preparation and process [1].

As part of the ABET2000 process, engineering programs are required to "describe faculty involvement in interactions with students", and "describe the assessment process, document the process by which the assessment results are applied, and provide data that shows the processes are working and producing the desired results". The GRASP Program (Gaining Retention and Achievement for Students Program) supports the ABET2000 accreditation process by documenting a successful faculty development program and positive faculty-student interactions which supports for continuous improvement of the engineering programs. This data documents the faculty involvement in interactions with students and the process by which the results were applied. This program also documents the desired results of greater student achievement and retention as seen through student grades.

Interactive Styles of Engineering Students

While research does suggest that interacting with faculty is important for student development [2], not all students interact with faculty in the same manner. Students have a dominant interaction style. Interaction styles are the way, and with whom, students interact when they learn. There are four basic interaction styles [3]:

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- Student-faculty-formal (during class): students who learn best by interacting with faculty during class
- Student-faculty-informal (outside of class): students who learn best by interacting with faculty outside of class (after class, during office hours, through email or phone)
- Student-Student: students who learn best by interacting with other students (both during class and outside of class)
- Student-Self: students who learn best by not interacting with the faculty or other students

Research suggests the engineering students who are most successful, the seniors and white students, have the interactive style which is traditionally used most often in engineering programs, students learning by themselves. While the students who are less likely to be retained in the engineering courses, freshmen and minority students, have different interactive styles. Freshman report the interaction which best supports their learning is learning with faculty outside of class and minority students report learning with other students. In addition, while both males and females report their most successful interactive style was learning by themselves, the males' second most successful style was learning with other students, while the females' was learning with the faculty outside of class [3]. Many engineering programs are including team work and group work as part of their curriculum, while few are incorporating informal faculty interaction as part of their curriculum.

By using the information learned about interactive styles, faculty can become aware of alternative instructional styles which can encourage the participation and inclusion of diverse students. These observed differences in interactive styles suggest multiple instructional strategies may be helpful in creating successful learning opportunities for diverse students.

Data Collection

Beginning in the spring of 1999, the authors began observing in selected Civil Engineering and Mechanical Engineering courses at NMSU. Since 1999, the author has been observing selected courses in all engineering departments. Data were collected on student interactions with faculty, and student interactions with other students, during and between classes.

Students enrolled in the selected engineering courses completed an Interactive Learning Style Instrument [4] , which determined students' preferred interaction style. Students also completed a learning styles instruction to determine if they were visual, auditory, tactile, or kinesthetic learners. All students participating in the study signed permission forms and were assured their data would be confidential and given only to their professor and the researcher. The professor noted the students' styles on the grading sheets for use during the semester. Once the professor understand a student's interactive style and learning style, s/he has the information necessary to provide opportunities to support the interactive style of that student.

The author observed the participating classes once a week and collected data on who was interacting, and in what way, during class. The author discussed specific behaviors with the faculty which support increased student achievement through positive interactions during class. The author then observed for these specific interaction patterns during class.

Classroom Observation Patterns

During the fall 2000 semester at NMSU the author collected data in the participating engineering courses. The data collected during classes included; faculty initiated interactions (faculty questions) with student responses (answers), student initiated interactions (students ask question of the faculty or made a comment about course material), interactions with faculty directly after class, and students interacting with other students during or directly after class.

Since research indicates increasing interactions between faculty and students and among students will increase student learning, [5,6,7] this program focused on increasing the number of interactions students participated in, as well as offering these interaction opportunities to diverse students. In the beginning of the semester there was an average of 28 interactions per class, with the majority of the interactions taking place with the white, male students (65%). By the end of the course there was an average of 113 interactions per class, with the interactions reflecting more closely the classroom demographics. Classroom observation data is shown in Table 1.

Table 1
Observed Student-Faculty Interactions During and After Class by Respondent Demographics

	W-M	W-F	H-M	H-F	I-M	I-F	Other	Total
Class Demographics	36%	10%	30%	12%	3%	4%	5%	100%
Beginning of Semester:								
Average Number of Interactions	18	2	5	1.5	1	0	.5	28
Percentage of Interactions	65%	5%	18%	8%	3%	0%	3%	100%
End of Semester:								
Average Number of Interactions	53	9	37	11	1	2	0	113
Percentage of Interactions	47%	8%	33%	10%	>1%	2%	0%	100%

White-male students made up 36% of the students attending the classes. At the beginning of the semester they interacted with the faculty and other students 65% of the time, either asking the faculty or other students questions, or answering them. By the end of the semester they were asking and answering 47% of the questions, increasing the average number of interactions they participated in during a class from of 18 to 53.

White-female students made up 10% of the students attending classes. At the beginning of the semester they interacted with the faculty and other students 5% of the time. By the end of the semester they were asking and answering 8% of the questions, increasing the average number of interactions they participated in during a class from two to nine.

Hispanic-male students made up 30% of the students attending the classes, interacting in 18% of the interactions at the beginning of the semester and 33% by the end of the semester, and, increasing the average number of interactions per class from five to 37.

Intervention Strategies

The researchers also met with the faculty to discuss classroom observations and suggest strategies which will support students interactive styles. One of the simplest, yet most important strategy recommended was for the faculty to learn and use students' names. Most faculty know students' names, yet don't address them by name, either during or between classes. Many students don't realize their professors know their name, and feel they are invisible. Regardless of a student's dominant interaction style, students participate more actively in their education when they are acknowledged by name during and between classes by faculty, secretaries, lab technicians, and department heads. By calling students by name in class, the faculty are offering the opportunity for the more silent students to participate, inviting these students to become involved in their education.

Ask students to re-state the material. Once a faculty member has solved a problem or completed a section of lecture, it is common for the faculty to ask if there are questions, and get little or no response. This does not necessarily mean students understand the material the faculty has presented. Since the students have not started to process the new information yet, they do not know what their questions are yet. Instead of asking, "any questions" or "is everyone OK with the that?" faculty can ask a student to restate what was just gone over in class. This way, students are able to hear the information again. They process the new information when they hear it presented in a different way or by a different person. This process is also effective for showing students where they have gaps in understanding.

Provide opportunities for students to interact with other students during class. Student-to-students interaction in class is important, especially for students whose dominant interaction style is student/student. Faculty can give students the opportunity to work a problem or partial problem with other students during class by scheduling a problem for students to solve in class in groups. This gives students an opportunity to process the information the faculty just gave them and come to an understanding of this new information. It also allows students to become active participants in their own learning and get feedback on where they might have gaps in understanding. It only takes five minutes of class time for a group of students to set up a problem. Students say this tells them what they do not know, while the professor is in the room. When students watch their professor work a problem, they believe they understand it, until they are at home alone, doing homework, and realize they don't know how to start.

We suggest faculty look at the grades of the students, at least by mid-term, and intervene if there appears a problem. Some students can become "stuck", on a particular concept, homework, or lab, which affects their grade from then on. If a professor becomes aware of problems and speaks to the student, either recommending tutoring, help for test anxiety, or training for study skills, note taking, or reading technical books, students can raise their grades. This is especially important with "border-line" students, those students who are one or two points

away from making a grade. Discussing their course work, quizzes, homework, and tests can help the border-line "D" student to receive a "C", or the border-line "C" student to receive a "B". This is important for those students who have a dominant faculty-student interactive style and who have not ever met with their professors. It is also important for students who are self-interactors, those students who do not interact with the faculty or other students. If they can not understand the material by themselves, they are likely to withdraw or fail, unless the faculty intervenes.

Student Results - Increased Retention and Achievement

There was an average increase of 9% in student retention and achievement from the semester before the faculty participated in the program to the current semester. This was measured by students' final course grades and the number of students failing or withdrawing from the courses. As seen in Figure 1, the participating courses increase the number of students who received the grade of A, B, or C during the research semester from 7-16%.

For female engineering students, there was an interesting increase in student retention and achievement from the semester before the faculty participated in the program to the research semester. As seen in Figure 2, except for one class, all female students who participated in this program during the research semester received a grade of an A, B, or C. The semester before this interaction project, some courses had a retention/achievement rate for female students as low as 50% This was measured by students' final course grades and the number of students failing or withdrawing from the courses.

Figure 1
Student Results and After Program
Spring & Fall 2000 Semesters (N=677)

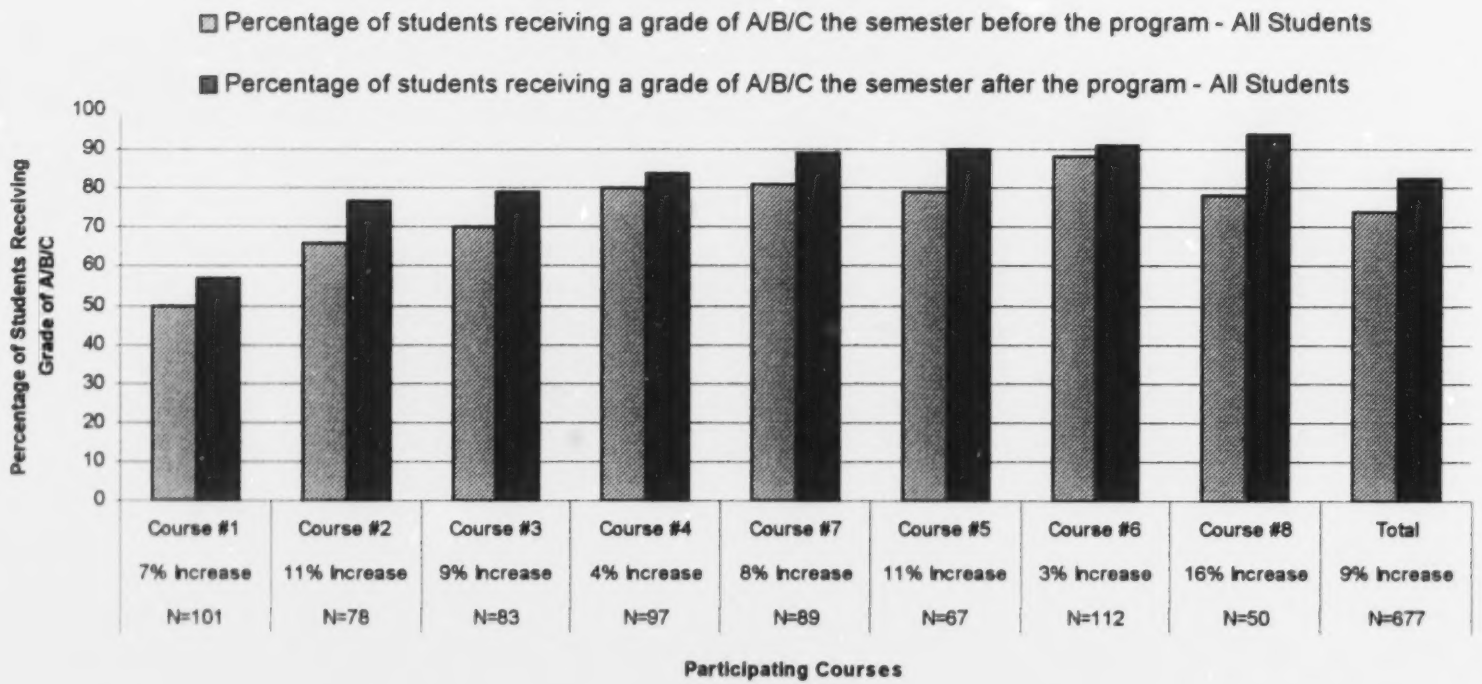

Figure 1: Student Results Before & After Research Semester - All Students

Figure 2
Female Student Results and After Program Semester
Spring & Fall 2000 Semesters (N=100)

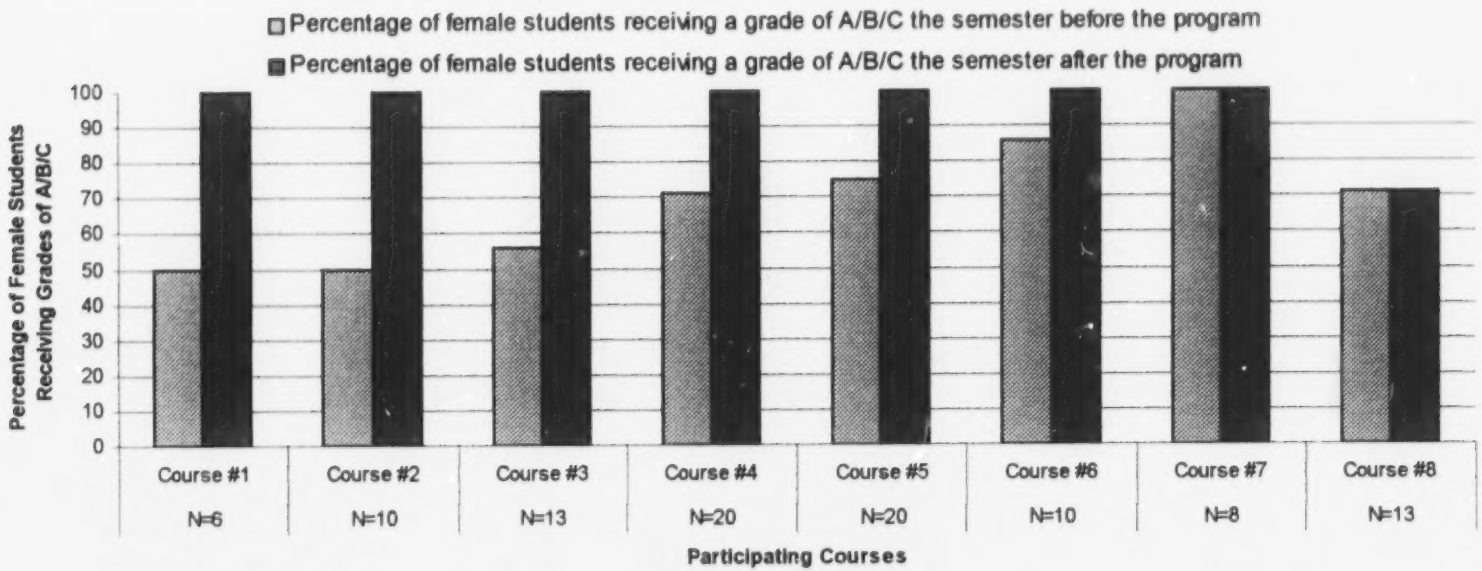

Figure 2: Student Results Before & After Research Semester - Female Students

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